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| 10/676,959 | 09/30/2003 | Daoqiang Lu | 42P17603 | 8132 |

8791 7590 02/21/2006

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| EXAMINER |
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KERNS, KEVIN P

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| ART UNIT | PAPER NUMBER |
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1725

DATE MAILED: 02/21/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/676,959

Applicant(s)

LU ET AL.

Examiner

Kevin P. Kerns

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 January 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-10 is/are pending in the application.
- 4a) Of the above claim(s) 11-30 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☒ Claim(s) 1-30 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 September 2003 and 25 January 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. This application contains claims 11-30 drawn to a non-elected invention. A complete reply to the final rejection must include cancellation of non-elected claims or other appropriate action (37 CFR 1.144) See MPEP § 821.01.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Master et al. (US 5,988,485) in view of Parhar (US 6,752,309).

Master et al. disclose a method of assembling a substrate and a die in a flip chip configuration, in which the method includes the steps of applying a flux, including an organic flux solvent (e.g. alcohols) and a monomer to be polymerized (metal oxide-reducing activator that includes, for example, carboxylic acids that have a degree of water solubility depending on number of carbon groups), on a substrate having solder bumps and placing a die on the substrate (see Figures 1 and 2); reflowing the die in a reflow device at a reflow temperature that is higher than the melting point of the flux solvent (to be vaporized during heating) and the monomer to be polymerized, with the reflowing temperature profile inherently being a temperature profile that includes a heating (increasing) temperature, a maintenance (nearly constant) temperature, and a cooling (decreasing) temperature, and forming solder joints from the melted solder bumps to be solidified; removing the polymerized residue (from the completed monomer/polymer polymerizing process) in a cleaning (de-fluxing) process via an environmentally friendly water-soluble solvent heated to 70-90 degrees Celsius; and dispensing an underfill material in the gap between the die and the substrate (abstract; column 3, lines 33-67; column 4, lines 1-67; column 5, lines 1-4; and Figures 1 and 2). Master et al. do not specifically disclose that the flux monomer/polymer is (substantially or completely) water soluble, while having the claimed defined temperature profile during use of a substantially or completely water soluble flux.

However, Parhar discloses a method for using water soluble fluxes in either a monomer or polymer form for use with bonding with solder, in which the flux includes at least one wax carrier (column 1, line 45 through column 2, line 14), at least one

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surfactant (column 2, line 15 through column 4, line 5), and at least one activator (column 4, lines 6-58) and is configured to be heated to inherently create a temperature profile of heating, nearly constant, and cooling regions, such that the surfactant and activator components in the flux are substantially or completely water soluble, with the water soluble flux being advantageous for providing the ability to remove flux residue without exposure of people and the environment to harmful volatile organic chemicals (abstract; column 1, line 7 through column 5, line 9; and column 5 Table).

It would have been obvious to one of ordinary skill in the art at the time the applicants' invention was made to modify the method of assembling a substrate and a die in a flip chip configuration, as disclosed by Master et al., by using a flux that is (substantially or completely) water soluble with a defined temperature profile, as taught by Parhar, in order to provide the ability to remove flux residue without exposure of people and the environment to harmful volatile organic chemicals (Parhar; column 1, lines 13-23).

Response to Arguments

5. The examiner acknowledges the applicants' amendment and corrected drawing sheets (replacement and annotated) received by the USPTO on January 25, 2006. Prior objections to the drawings, abstract, specification, and claim 9 have been overcome due to the various amendments. In addition, the applicants are referred to above section 1 regarding the requirement to cancel the non-elected claims. Claims 1-10 remain under consideration in the application.

6. Applicants' arguments with respect to claims 1-10 have been considered but are moot in view of the new ground(s) of rejection.

With regard to the applicants' remarks/arguments on pages 11-13 of the amendment, the applicants are referred to the newly underlined portions that address the Master et al. reference of section 3. Although the claim amendments overcome prior rejections based on the Grigg et al. reference, the examiner respectfully disagrees with the applicants' assertions that either or both of the water solubility limitations (ranging from a complete or very limited degree) and/or the claimed temperature profile provide patentable features over the prior art references of record. It is noted that all prior art references include at least a few water soluble components. Although some components have "limited" water solubility (such as the carboxylic acids of Master et al.), there are no claim limitations to exclude these "limited solubility" components). Furthermore, reflowing processes have temperature profiles based on heating, maintaining, and cooling. The Parhar reference includes high water solubility components while addressing differing temperatures for their production and/or use. As a result, claims 1-10 remain rejected.

Conclusion

7. Applicants' amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US 5,215,602 is also cited in PTO-892.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Kevin P. Kerns whose telephone number is (571) 272-1178. The examiner can normally be reached on Monday-Friday from 8:00am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Kevin P. Kerns *Kevin Kerns 2/16/06*
Primary Examiner
Art Unit 1725

KPK

kpk

February 16, 2006